Mount Diablo Astronomical Society

Diablo MoonWatch

March 2011

GENERAL MEETING

Tuesday March 22nd, 2011

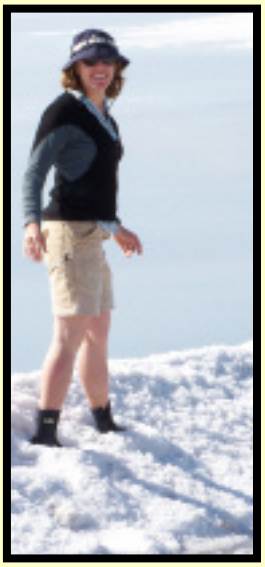
Salt Deposits on Earth and Mars

A case Study on Habitability

by Dr. Marilyn Vogel

Astrobiology is a field where geologists, astronomers, biologists, chemists and physicists converge to understand life's presence in the Universe.

The core question of Astrobiology is: What do we know about life on Earth and how can we use it to detect potential life elsewhere?



Please join us Tuesday March 22nd when Dr. Marilyn Vogel will explain her research on astrobiology.

It uses the concept of habitability to identify life's requirements, its signatures and where to look for it with telescopes and robotic probes. Habitability holds that life requires water, an energy source and organic molecules, and leaves indelible evidence in the form of fossils (remains), surfaces that it has impacted, and chemical signatures. Numerous areas of Mars and other planets meet life's requirements (or have met them in the past) and have been targeted for robotic exploration. Detecting signs of past life, or so called biosignatures is the main objective of the upcoming Mars Science Laboratory (MSL) Mission, set to launch later this year November or Decembe 2011and landing August 2012.

Marilyn Vogel grew up Charlottesville, Virginia and is a proud alumna of the Garden Club of Virginia's Nature Camp where she took her first course in field geology at age 11. At Nature Camp, she learned to love being outdoors, lost all fear of science, and first heard the 5-string banjo, an instrument she would later adore playing as an adult.

Vogel attended MIT as an undergraduate and completed her doctoral degree in the Stanford University School of Earth Sciences in 2003. Her thesis focused on developing new tools to interpret the Snowball Earth Theory as expressed in sedimentary units of southeastern California.

She began working as postdoc and later as a research associate in the Astrobiology Branch of the NASA Ames Research Center under Dr. David Des Marais in 2005. Her research has focused on mineralogy and organic geochemistry of modern hypersaline environments. She has lectured at De Anza College and currently holds a lecturer appointment at Santa Clara University.

Dick Flasck
Meeting Program Chair

Doors open at 6:45 p.m.
Concord Police Association Facility
5060 Avila Road, Concord

WHAT'S UP

Stellar Alchemy

by Steve Jacobs

Did you ever wonder where all of the elements in our world came from? Wonder no more. This month's "What's Up" will be a fast high level non-technical

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President's Corner

What Color is the Universe?

by Chris Ford

When it is cloudy the only opportunities available to observe astronomical objects are usually online or in the pages of a magazine or book. However it is often notable how wildly variable in color and appearance different images are of the same object. This raises the question of whether any of the images we see in the astronomical media are actually "real" in their descriptive accuracy. What do they tell us about the real color of astronomical objects? In fact if we add everything up, does the Universe itself have a predominant color?

Color?

The word "color" in the commonly accepted sense refers to those wavelengths of light that are visible to the color receptor cells called cones in our retinas. Light itself is quantifiable, its wavelength can be measured objectively, and its analysis is the very foundation of astronomical spectroscopy. To perceive incoming light as a coherent picture however requires processing in the brain for it to be visually meaningful as does photographically captured light. Processing in turn implies interpretation and modification of the light and we all know that individuals can perceive color differently. (ie: Color blindness)

We also know that when looking through a telescope, very few objects exhibit any color at all except through the very largest apertures, and even then what we see has little resemblance to the colorful pictures in the astronomical media. Deep sky objects especially are simply not bright enough to stimulate the cone cells in the center of our retinas. We can use averted vision to illuminate the surrounding rods that are more sensitive to very faint light but they have little sensitivity to color. Therefore, if "real" color is to be strictly defined by what our eyes can see directly, then only various shades of grey in a black and white image could be defined as "real" for most astronomical objects.

M42 imaged by Stuart Foreman and calibrated by Chris Ford

The advantage of photography

It can reveal color in objects that are just too faint to be seen visually by simply increasing the exposure time to record fainter colors and details. However the dynamic range from the brightest stars to the faintest nebulosity is extremely broad, and increasing the exposure time to capture the faintest details often leads to the brightest parts of the image becoming overexposed, losing both detail and color. Our eyes are much better adapted than cameras at handling a high dynamic range but they have no ability to perform long duration exposures.

This single photographic exposure of M42 taken by MDAS member Stuart Forman and processed by the author shows what can be achieved through a simple DSLR camera. Though the color in this image is filtered by the camera sensor it is reasonably balanced in that it reveals details and colors in the nebulosity while not losing too much in the "burnt out" core.

(M42 imaged by Stuart Foreman, calibrated by Chris Ford, processed in photoshop by Mike Chasin)

There is far more usable data in the above image than is apparent. By stretching the data in an image manipulation tool such as Photoshop, many more details and colors become apparent even though this is exactly the same image. This illustrates that for a given exposure time what we see

President's Corner—What Color is the Universe? (Continued from page 3)

in an astronomical picture is almost always a result of the way in which that image has been processed to an aesthetic choice.

Larger amounts of color and detail can be extracted through multiple exposures. For example, a common trick in astrophotography is to take long and short duration exposures of a bright object and layer the short (unsaturated) exposure of the brighter areas on top of the longer exposure through a layer mask in Photoshop as the next image shows where the burnt out core of Orion is deemphasized. When done well this technique is seamless and the image is very appealing, but is the result more "real" than the first two images? All are exactly the same object but they look very different in fundamental ways. The emphasis placed on certain colors and the mixing of different exposures through masking is a completely artistic decision. It illustrates that all astronomical images are subjective interpretations and are not "real" in any objective sense. It also illustrates why Photoshop is one of the most influential astronomical instruments of the past two decades.

(M42 by Gerhard Bachmayer from the QHY-8 website)

We should always be aware that almost all images published in the astronomical media have undergone significant manipulation to make them more descriptive and aesthetically pleasing. The use of mapped or false color in narrow band images and infra-red astrophotography can be even more misleading in what it says about the real color of astronomical phenomena. Certainly for the purposes of communication, education, and above all beauty and aesthetic appeal, the use of false and manipulated color is perfectly acceptable, but we should not be misled that what we are seeing in these images is what we would see with our own eyes if they were more sensitive.

Meaning of "true color"

So if little of what we see visually or photographically represents "true" color and detail due to exposure, visual, and processing modifications what are the real colors of astronomical objects? Can we simplify the question posed by this article and objectively measure all of the optically visible colors in the Universe and represent them as a single averaged color that is objectively true? Does the Universe even have a color?

Your immediate reaction might be that the Universe is the deepest shade of black. However black is not a color but the absence of light, so if we were to measure the spectral color of all light emitting objects within visible wavelengths, correct for redshift and then average that color, it appears our Universe is actually a light shade of beige. The color in the following image represents the sum total of all the colors of all the stars, galaxies, and nebulae visible, and being a singular averaged color it is about as simple and "real" as we can get. Many billions of years ago the color of the Universe would have been somewhat bluer due to a greater number of younger stars but as it has aged, older and cooler red stars are becoming more prevalent and the current shade of beige is expected to become redder over time. Like paint the Universe also fades and darkens as it ages.

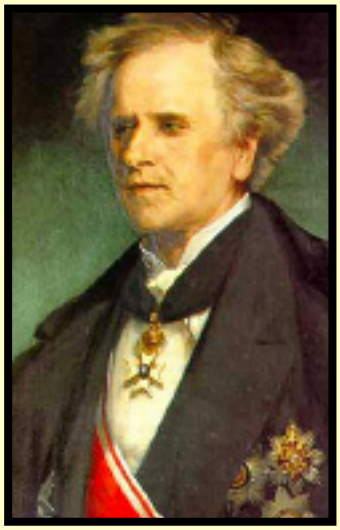
The averaged color of the Universe defined by Karl Glazebrook and Ivan Baldry

Today the Universe is a unique color that has been variously named Skyvory, Univerge, Cosmic Cream, Cosmic Latte, Big Bang Buff, and even Primordial Clam Chowder, an excellent color recommendation if you are looking to be at one with the Universe when you paint your house!

The Strange Orbit of Mercury

by Nathaniel Bates

Newton's laws explained so much of the Solar System's motion that eighteenth and nineteenth century physicists assumed that those laws explained all of universal motion. So much was explained that it was assumed that the Universe worked more or less as a giant machine. However, one mystery remained that could not be fully explained. The orbit of Mercury mystified Urbain Le Verrier, the nineteenth French mathematician who played a leading part in the discovery of Neptune. The orbit of Mercury did not seem to follow Newton's laws in one powerful respect, its perihelion precession. The perihelion precession of the orbit is defined by the wobble of the orbit of a planet. Think of the orbit of Mercury as an ellipse that wobbles up and down. Such wobbling is predicted by Newton's laws, which accurately predicts the precession of all planets other than Mercury. However, the precession of orbit of Mercury exceeds what Newton's laws predicted.



Urbain Le Verrier was no stranger to discovery.

As I stated, he is given primary credit for the discovery of Neptune, even though John Couch Adams is also credited. Le Verrier was able to discover Neptune by noticing discrepancies in the orbit of Uranus. It was obvious that a gravitation of a large body was affecting Uranus. Le Verrier also noticed the discrepancy in the orbit of Mercury, and assumed that a similar gravitational body was affecting Mercury's perihelion, or the closest approach of its orbit to the Sun. A hypothetical planet Vulcan was said to exist between Mercury and the Sun that would have affect Mercury gravitationally. Indeed, the same principle that applied to the mystery of the orbit of Uranus should also have clarified the mystery of Mercury, namely Newton's laws of gravitation. However, no planet between Mercury and the Sun was found and Newtonian science was stumped.

Let me relate one interesting aside about Mercury. There is a 3:2 resonance between a year and a day on Mercury. Every year on Mercury (about 88 Earth days) is equivalent to 1.5 days. That means that every two years is equivalent to three days. Such resonances are not unusual in the Solar System, and do not contradict Newton's laws in the least. They were even noted by Kepler, who was the first to figure out that planetary motion was elliptical. If anything, the fact that there were resonances of this nature helped to cement a "deist" view of the world among many scientists. Deism was the belief that a rational Universe was created by a Supreme Being, and then left to natural laws finely crafted for the good of all of Nature. Deists doubted the whole idea of miracles and supernatural interventions, preferring a mechanistic view of the Universe. They assumed that Newtonian laws would eventually explain everything. Odd anomalies like the perihelion procession of Mercury, and like the Michelson-Morley experiment, were destined to be explained as Newtonian laws were fine tuned.

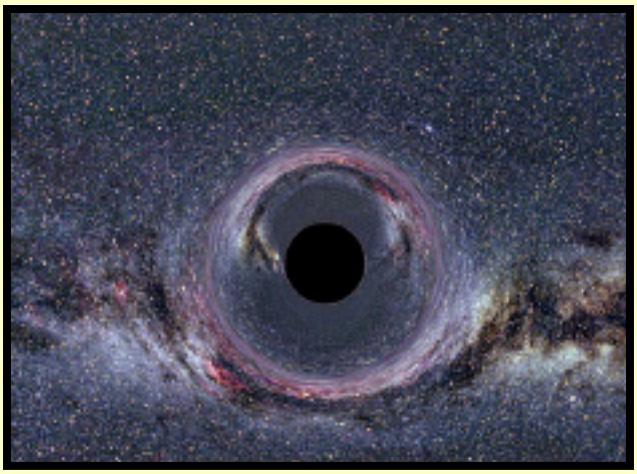
The orbit of Mercury

The problem is that the anomalies never went away. Mercury's perihelion process was supposed to be 5557 arc seconds per century. In fact, Mercury's precession was a full 5600 arc seconds per century and Le Verrier wanted to understand why. Most of us would chalk it up to observer error and go to bed (be honest!), but this Astronomer was dedicated and would not let the issue rest. It was not until Einstein's Relativity that such anomalies as Mercury's perihelion and the failure to detect the aether were now seen as part of a larger Physics. Einstein's General Theory of Relativity demonstrated that gravity was equivalent to the curvature of space-time itself. A gravitational field of incredible force literally bent space-time. Einstein's equations explained the discrepancy in the orbit of Mercury. Einstein's 1905 "miracle year" would put an end to the mystery of Mercury.

Well, almost. The General Theory of Relativity had yet to be

The Strange Orbit of Mercury *(Continued from the precious page)*

proven. Fortunately, it could be tested. Relativity predicted that gravitation would bend space-time, hence bending light itself. An eclipse of the Sun could easily verify this prediction. The Moon is fine tuned to block our view of the Sun exactly. If the Sun could actually "bend" the light of a star, then we would actually see a star hidden just behind the sun if we could see the stars near the sun. An eclipse would be the proof that Einstein needed.



When Arthur Eddington confirmed this effect during the eclipse of 1919, Einstein's General Relativity was vindicated. And, Le Verrier's question as to why Mercury behaved the way it did was answered at last.

The mystery was solved, but the mechanistic view of the Universe was gone. The mechanistic cosmos depended on space and time being flat, i.e."Euclidean." The new view of the Universe was dynamic, and without the old certainties. Planet Vulcan was never discovered, but in the new century of Einstein and Quantum Physics a great many more discoveries would come that would revolutionize our understanding of both the very large and the very small. The strange orbit of Mercury led to a Universe that was even stranger, and yet no less wonderful.

Increase Science Literacy:

Share Your Love of Astronomy With Students

Partner with a local teacher to bring astronomy into a classroom and improve student understanding of science. Learn techniques to engage students and then visit a classroom four times over the next year. The time commitment is small and the effects can last a lifetime. Students love to have their "very own astronomer" and past participants claim they were treated like rock stars! Astronomy is a great way to inspire students and Project ASTRO gives you the tools to be effective in the classroom.

Find out more and apply online here:

http://www.astrosociety.org/baprojectastro.html

Inquiring Minds Want to Know:

What's Up?

Whether you have a personal hobby, a special interest, unusual equipment, or any other topic in an astronomical vein, you are invited to share it with the members of MDAS by giving a "What's Up" presentation. If you've never done it before, here is your chance to pique their curiosity and maybe give others food for thought about their own ideas for a "What's Up". If you have given one previously, perhaps you can give some fresh insight or the latest findings on a prior subject.

To find out more and volunteer, contact: Kent Richardson kayarind@sbcglobal.net

Membership Renewal Time!

It's Membership Renewal Time!

by Marni Berendsen

Renew your MDAS membership and your magazines online!

ANNUAL MEMBERSHIP DUES OF $25 ARE DUE BY APRIL 1, 2011 for members on the April membership cycle. That's almost everyone. Some of our newer members renew in October, but they will be notified separately.

To renew your club membership, you may EITHER:

- Renew online using Paypal or your credit card at http://www.mdas.net/membership/paypalreg.htm#Membership_Renewal. On the same web page, please consider making an additional MDAS Donation of $10 or $15 to further support our club. Even $5 helps.
- OR if you do not have internet access or prefer not to make online payments, you may mail a check for $25 (or more!) made payable the M.D.A.S. to this address:

Mount Diablo Astronomical Society
P.O. Box 4889
Walnut Creek, CA 94596
MAGAZINE SUBSCRIPTION RENEWALS

All Sky & Telescope and Astronomy magazine subscriptions renewals are handled online – AT THE CLUB DISCOUNT RATE!

The Astronomical Society of the Pacific has made arrangements with these magazines to allow members of the NASA Night Sky Network to renew at the club discount rate. All you need is a login for the Night Sky Network (NSN) through our club.

You can log into Night Sky Network and go to the Links page to find the "New and Renewal Subscriptions" link. Here's the direct link: http://www.astrosociety.org/magazine/

If you don't have access to a computer, please renew by mail directly with the magazine using your renewal notification.

Any questions, please email memberinfo@mdas.net or call Marni Berendsen at 925-930-7431.

Telescopes Needed

by Jim Head

Thursday March 10, 2011, 7:00 PM - 9:00 PM

Timber Point Starparty, Timber Point Elementary School, Discovery Bay, CA Setup 6 PM
More details: http://nightsky.jpl.nasa.gov/club/event-view.cfm?Event_ID=23715

Friday March 11, 2011—6:00 PM - 9:00 PM

EPMS Stargazing Night, Eagle Peak Montesori School, Walnut Creek, CA Setup 5 PM
More details: http://nightsky.jpl.nasa.gov/club/event-view.cfm?Event_ID=25755

Monday March 14, 2011 — 6:30 PM - 8:30 PM

Cub Scout Astronomy Night, Indian Valley Elementary School, Walnut Creek, CA Setup 6 PM
More details: http://nightsky.jpl.nasa.gov/club/event-view.cfm?Event_ID=25784

Monday April 4, 2011 — 7:00 PM - 9:00 PM

Diablo View Middle School Starparty, Diablo View Middle School Starparty, Clayton, CA Setup 6 PM
More details: http://nightsky.jpl.nasa.gov/club/event-view.cfm?Event_ID=23717

Thursday April, 14, 2011, 8:00 PM - 9:30 PM

Joaquin Moraga Intermediate Starparty, Joaquin Moraga Middle School, Moraga, CA Setup 7 PM
More details: http://nightsky.jpl.nasa.gov/club/event-view.cfm?Event_ID=22946

Mount Diablo Astronomical Society Event Calendar–March 2011

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
27	28	5 events: Click here to view 1	9 events: Click here to view 2	9 events: Click here to view 3	18 events: Click here to view 4	20 events: Click here to view 5
4 events: Click here to view 6	7	9 events: Click here to view 8	7 events: Click here to view 9	6 events: Click here to view 10	11 events: Click here to view 11	25 events: Click here to view 12
7 events: Click here to view 13	7:30 PM FVAS Monthly Club Meeting (IL) 14	5 events: Click here to view 15	4 events: Click here to view 16	8:00 PM DAS Public Night @ Chamberlin (CO) 17	11 events: Click here to view 18	8 events: Click here to view 19
7:30 PM CPRCO Public Viewing (CA) 8:00 PM Top of the Lawn (NY) 20	21	4 events: Click here to view 22	3 events: Click here to view 23	8 events: Click here to view 24	7 events: Click here to view 25	10 events: Click here to view 26
7:30 PM CPRCO Public Viewing (CA) 8:00 PM Top of the Lawn (NY) 27	10:00 AM PAS@UCO PAS Solar Viewing (OK) 28	8:00 PM DAS Public Night @ Chamberlin (CO) 29	8:00 PM CMAA Laws Observatory Viewing (MO) 30	4 events: Click here to view 31	1	2

Messier Marathon is rescheduled for April 1

by Jim Head

The Messier Marathon is rescheduled for April 1. Re-sign up if you can make it.
Start time is an hour later, 8:00 PM.

Friday April 1, 2011 8:00 PM

Messier Marathon, Private Event at Lower Summit Parking Lot, Clayton, CA Setup 6 PM

More details: http://nightsky.jpl.nasa.gov/club/event-view.cfm?Event_ID=26495

Board Members & Address

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Vice President
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Secretary and Refreshments
Moon Trask - metallicamoon@sbcglobal.net

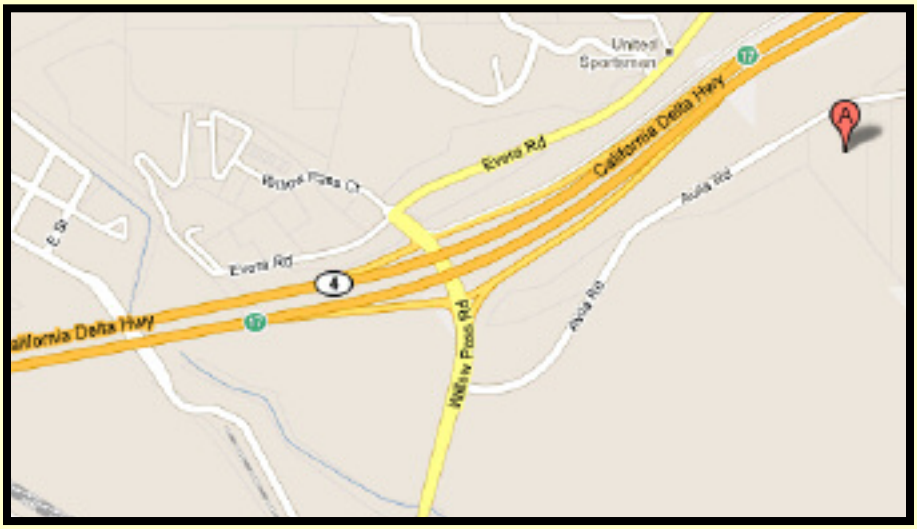
New Member Steward
Nick Tsakoyias - claytonjandl@aol.com

Mailing address:
MDAS
P.O. Box 4889
Walnut Creek, CA 94596-

General Meetings:
Fourth Tuesday every month, except on the third Tuesday in November and December. Refreshments and conversations are at 6:45pm. Meetings begin at 7:15pm.

Where:
Concord Police Association
5060 Avila Road, top of the
Take Avila Road from Willow

Directions to facility:



What's Up

Continued from page 1

look at Nucleosynthesis.

Nucleosynthesis is a fancy word for alchemy - mixing stuff together to get different stuff. But in this case the mixing is done in the core of stars and the results are different atoms. I will explain the steps in the creation of atoms based on the accepted work of many 20th century scientists.

Hold on to your hat and buckle up the seatbelt on those folding chairs, this will be a fast paced discussion.